

# **Asbestos in California**

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**Asbestos Site Evaluation, Communication and Cleanup**

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# California Background Overview

- Extensive geologic formations with NOA
- Former commercial mine sites.
- Industrial sites with buried debris containing asbestos and asbestos in soils
- Demolition of buildings and asbestos product releases, eg. Brake linings.
- Background concentrations in air and soil needed



# Asbestos Sources in California

- Maps show Ultramafic areas
- Also finding NOA in Mafic areas
- Roads surfaced with serpentine
- Fill materials including decomposed granite
- Alluvial washouts from NOA areas (eg. Arroyo Pasajero)



# Asbestos in California Soils

- NOA found in 45 of 58 counties, including the San Francisco Bay area.
- 1.4 % of the state's surface area is in the mapped NOA area
- Miles of unpaved roads covered with serpentine
- Extent of fill material contaminated with asbestos debris is unknown



# California Background Mineral Forms of Asbestos

- All of the 6 forms defined in regulation including:
  - Chrysotile
  - Tremolite
  - Actinolite
  - Amosite
  - Crocidolite
  - Anthophyllite
- Transition fibers
- Cleavage fragments



# Regulatory Frame Work

- California Air Resources Board develops regulations that Local Agencies implement
- Recent regulations govern asbestos content in surfacing material
  - Non detect based on CARB 435 Method with PLM Detection Limit of 0.25 % (400 point count)
- Another requires dust suppression and possible asbestos air monitoring for all construction



# Regulatory Frame Work

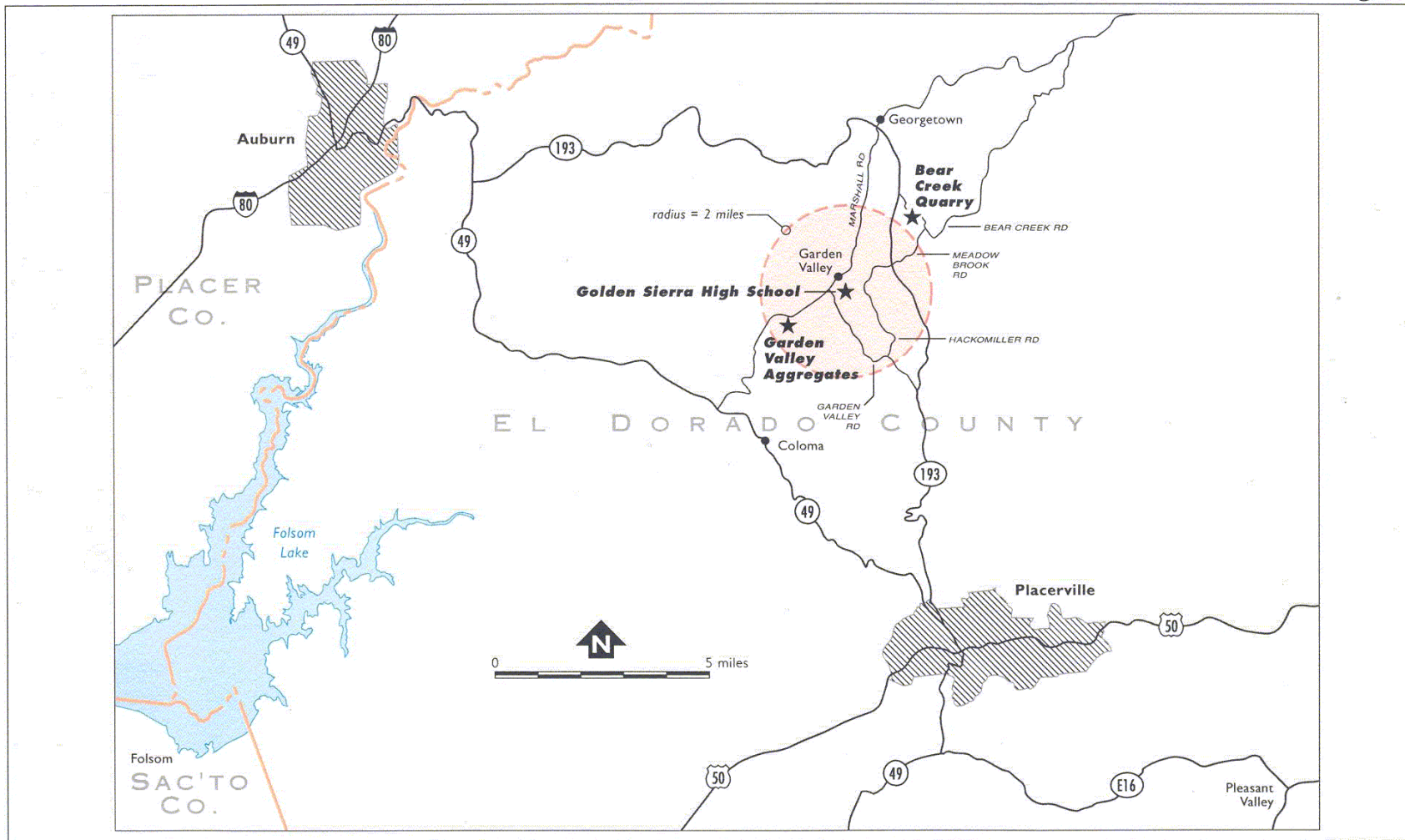
- Department of Toxic Substances Control
- Oversee cleanup of hazardous substances release sites
- Environmental appraisal of new school sites
- Regulate Hazardous Waste Disposal
- NOA is a hazardous substance if released to the environment
- Soils Excavation projects are Bevell Exempt



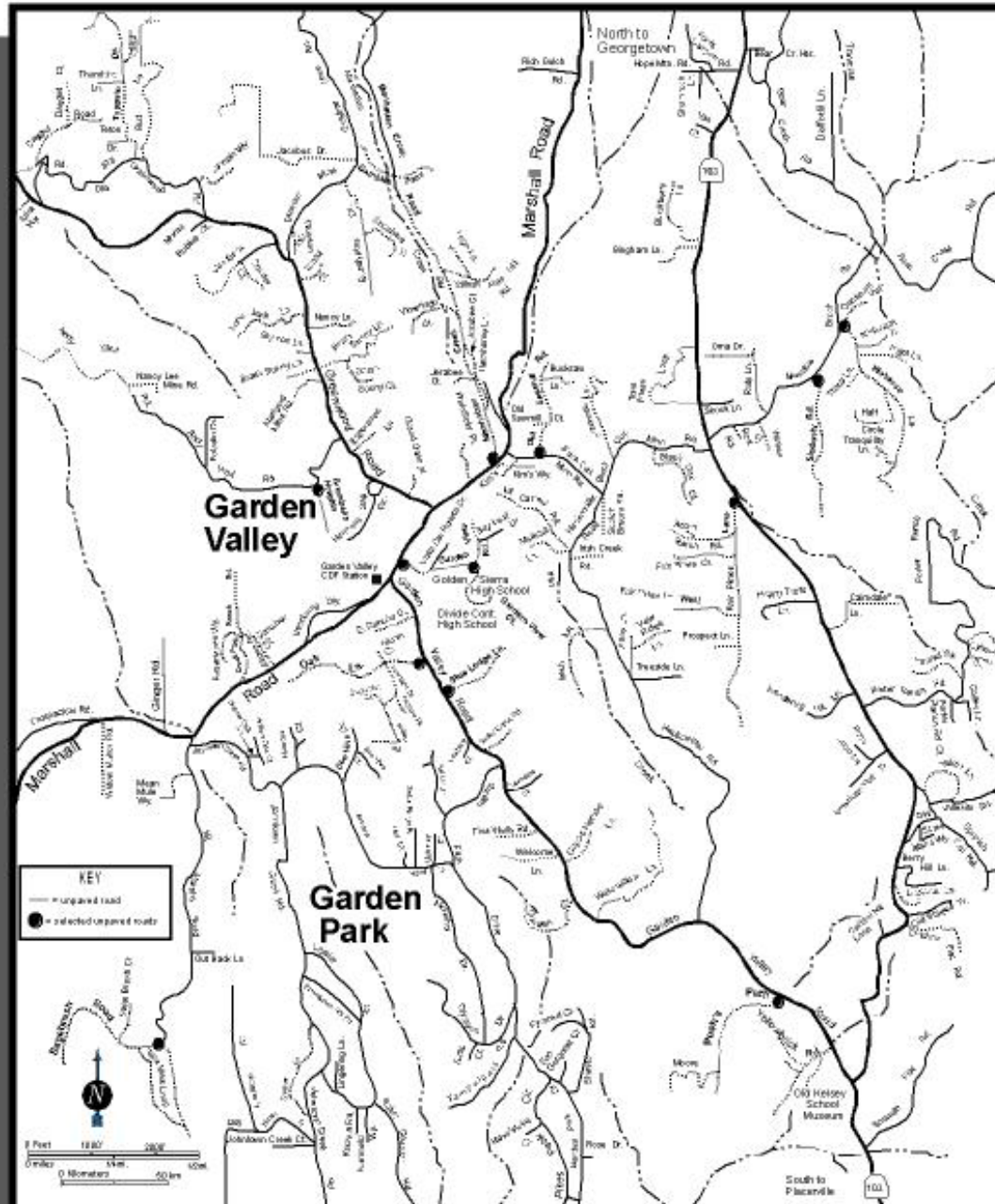
# Garden Valley Source Study

- 1998 and 1999 air monitoring detected elevated levels of asbestos in ambient air
- DTSC, funded by USEPA, conducted a study to identify potential sources within a 16 mile study area
- Possible sources included an Active Quarry, Inactive quarry, unpaved roads surfaced with serpentine aggregate





## A vertical photograph capturing a serene landscape. In the foreground, a still lake reflects the sky and the surrounding greenery. The middle ground is dominated by a thick forest of tall, dark evergreen trees. At the base of the forest, a small clearing with a few scattered trees and a wooden bench is visible. In the background, a rugged mountain peak with patches of snow rises above the treeline under a clear blue sky.



# Serpentine Covered Roads and Road Cuts

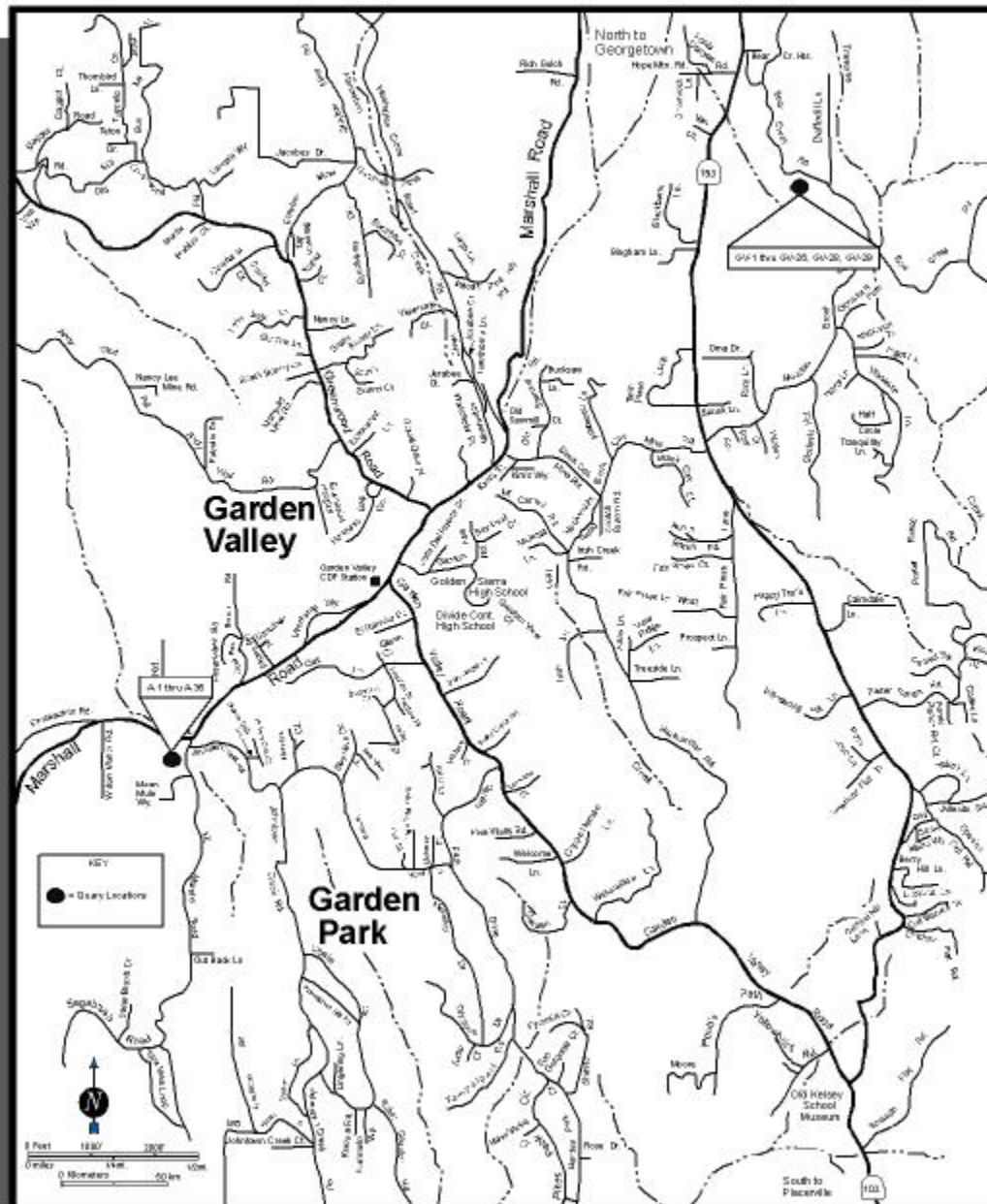


# School Bus Stops



# Garden Valley Site Discovery Area

## Map of Quarry Locations and Sample Numbers



# Two Serpentine Rock Quarries



Bear Creek Quarry



Garden Valley Aggregates



# ACTIVITIES BY EXPOSURE PATHWAY – SOIL Sampling

## Methods Used

Surface scrapes of 1 to 2 inches

One quart

Silt to cobble size

Number of Samples: 137 samples collected

Roads: 52 samples/17 size fractionated

Bus Stops: 13/8

Quarries: 64/15

Road Cut: 8/2



# SOIL Sample Preparation

## ALS CHEMEX

- Soil Moisture determined
- 42 samples were size fractionated by 200 mesh sieve to  $<75\text{ }\mu\text{m}$  and  $>\text{than } 75\mu\text{m}$
- The greater than 75 fraction and total samples were then prepared following CARB 435 method preparation.



# RJ LEE Analysis

- Analyzed using CARB 435 PLM method
- Results expressed as percentage of 400 points counted and identified by  $<5\mu\text{m}$  and  $>5\mu\text{m}$
- Counted fibers identified by asbestos type



# Forensic Analytical

- 100 samples analyzed using USEPA 600/R-93/116 TEM method
- 18 samples analyzed by CARB 435 PLM as QA/QC check
- 6 samples analyzed by XRD



# Soils Analysis Results

- Results from both labs significantly lower than samples collected in the 1980's by USEPA
- Discrepancies between PLM and TEM data and between labs
- XRD identified Lizardite and Chrysotile with extensive cleavage fragments



# EMSL Analysis

- To resolve analytical questions, samples were sent to a third lab for analysis
- All samples analyzed using both CARB 435 and USEPA 600/R- TEM
- These results were used for report conclusions and recommendations



# Garden Valley: Ambient Air Sampling

- Stationary samplers with Met stations  
24 hour runs
- Location and Number of Samples
  - Four community locations 17 days in 1998, 1999 and 2000
  - background 17 days in 1998, 1999 and 2000
  - Quarries 5 days in October 2000



# Air Monitoring Results

- Similar to previous sample results
- All data combined to update risk assessment  $10^{-5}$
- Quarry results similar to those in the community



# Report Conclusions

- All sources had comparable levels of asbestos
- Chrysotile is the primary form of asbestos found
- Asbestos levels in the 75 micron sieved fractions are slightly higher than the larger size fraction
- Primary source is likely the unpaved roads
- Recommended road emission study



# Analysis Issues

- Laboratory analyses were inconsistent with expectations
- TEM counts lower than PLM
- Possible inconsistencies in lab prep methods
- Data not reproducible among labs.



# Road Emission Study

- Conducted on Slodusty Road in July 2002
- Experimental design: Stationary monitors placed at distances from road way
- Ran for duration of specific road test
- Ran 2 tests daily



# Slodusty Road



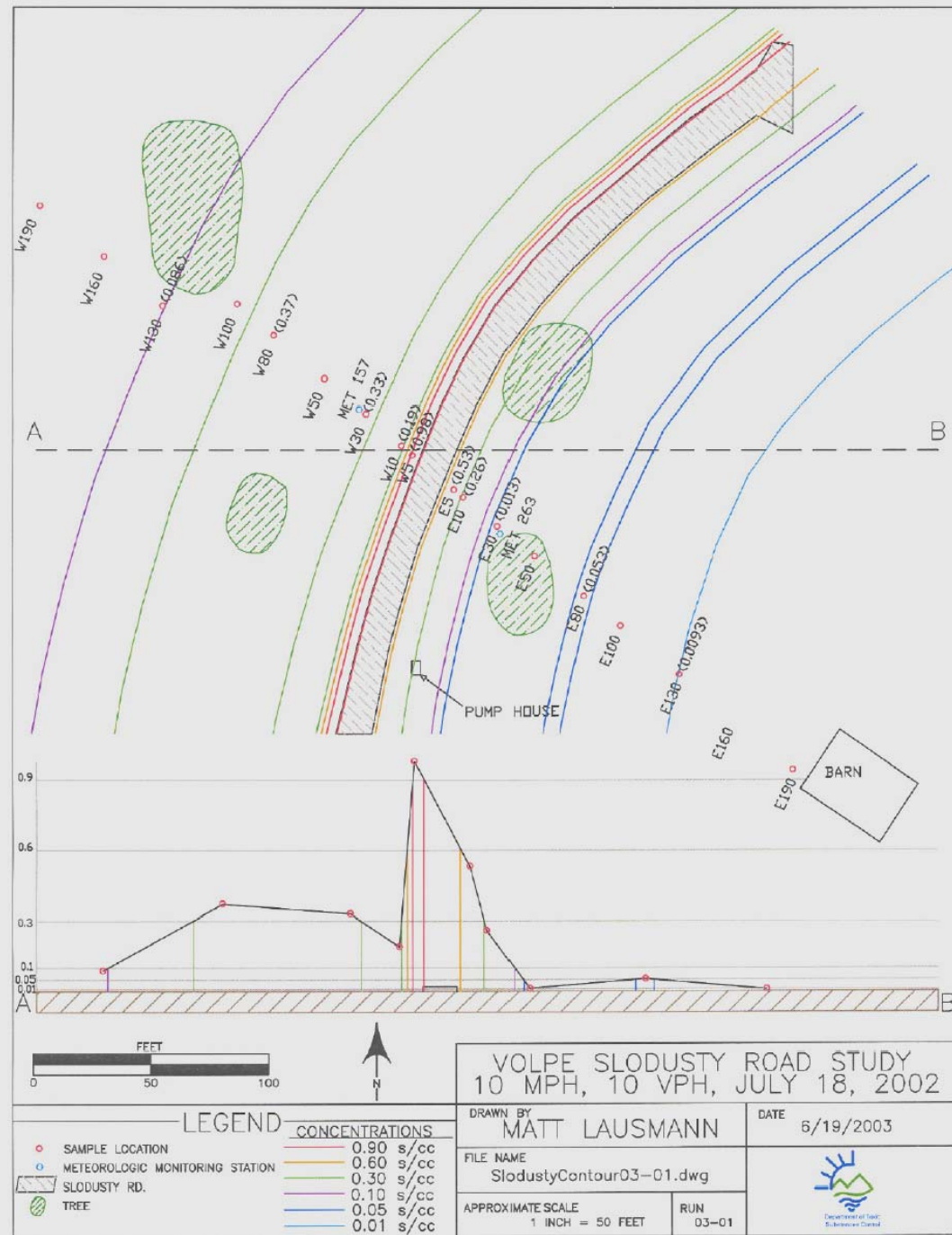
# Analysis Issues

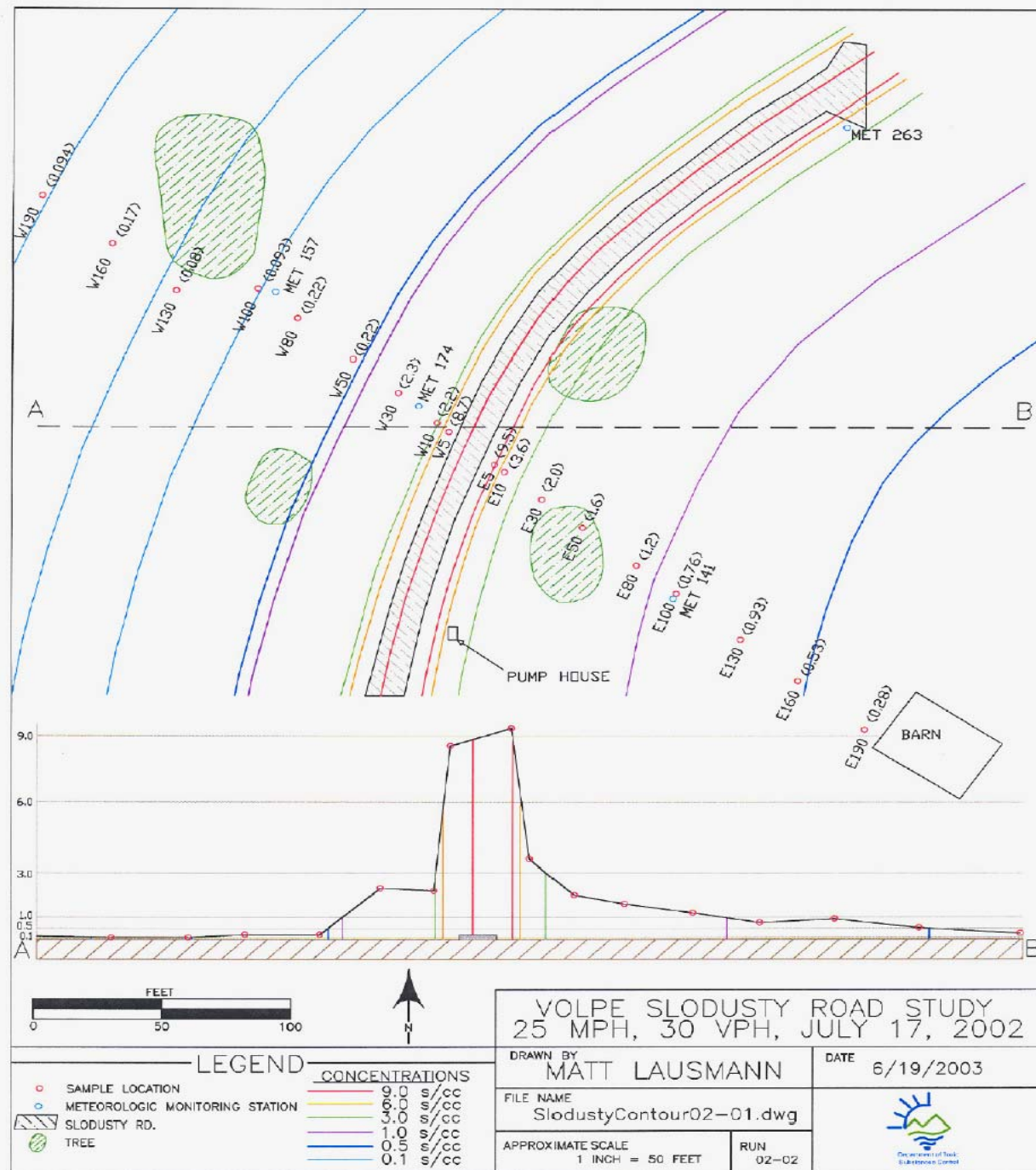
- EMSL used ISO 10312
- QA/QC samples sent to Resource ???...
- Significant difference in counts due to transition fibers
- Took nearly 8 hours to do one sample using ISO
- Used AHERA TEM method with stopping rules





# Slodusty Road Emission Study 10 vehicles per hour at 10 miles per hour





# Resurfacing Project

- Resurfaced Slodusty Road
- Chip Seal with Limestone Aggregate Base and oil Emulsion Covered by Limestone Chips



# Slodusty Road



# Emission Study Phase II

- August 2003
- Repeated road emission study after road resurfacing completed
- Two runs
- Results pending



# Air Sampling Problems

- Filter overloading during emission studies
- Wind Direction and Velocity Change
- Temperature and Humidity effects



# Air Analysis Issues

- Detection limits
- Counting rules
- Transition fibers
- Fractured lizardite that looks like fibers
- Chemistry of lizardite, chrysotile is same



# Low Volume Personal Sample Pumps

- Low volume personal sample pumps used during both Emissions studies
- Workers were not down wind during emission studies
- Filters analyzed using PCM for OSHA requirements and TEM AHERA method
- Results OSHA levels were not exceeded



# Slodusty Road Bulk Samples

- 25 surface scrape samples collected from road bed
- Individual samples analyzed using USEPA 600/R-93/116 TEM
- Split samples: 25 composited to 5 for Berman Crump Elutriator analysis
- Results pending



# Site Background

## Oakridge High School

- Oakridge High School, El Dorado Hills
- 1600 students
- Middle of a rapidly developing area
- NOA deposits on and next to high school



# Oakridge High School

- School began construction of two new soccer fields in 2002
- No regulatory oversight required at the time.
- Cut/fill from slope adjacent to school.
- No cover, drainage or erosion control measures while construction was idle
- Visible veins of asbestos in cut slope, confirmed by sampling and analysis to be tremolite





# Oakridge High School

- Mitigation Phase I started June, 2003
- Cover soccer field with geo fabric, two feet of clean fill and sod
- Shot-crete upper slopes, vegetate lower slopes and restrict access
- Cover exposed areas of school with fill material and landscape/planter boxes or paving.



# Soccer Field Before Completion



# Oakridge High School

- Air monitoring during mitigation work
- Pre sampling to establish reference concentrations
- Sample during all mitigation work on soccer fields
- Workers wear low volume personal air pumps



# Air Monitor Locations

- Map showing air monitoring locations



# Oakridge High School

## Sample analysis:

- Ambient stations use AHERA method with sensitivity of 0.0005 s/cc
- Laboratory passed USEPA Performance Sample assessment
- Personal monitors analyzed by PCM for OSHA compliance and by TEM



# Oakridge High School

- Air monitoring results provided as handout
- Outdoors: Pre work results had some elevated results
- During mitigation, average results near detection limits.



# Oakridge High School

- Out door assessment: Phase II
- Track/football field
- Basketball courts
- Tennis Courts
- Baseball and softball diamonds



# Oakridge High School

- Activity assessment with stationary monitors
- Track surface is decomposed granite
- Tested by dragging box over track surface to “prep” field for an event.
- Soil samples of decomposed granite collected



# TRACK Photo



# Basketball Photo



# Baseball Photo



# Oakridge High School

- Tennis Courts and Basketball courts were swept
- Baseball diamond infield was tested dragging box around infield to prep surface
- Stationary air monitoring stations with Met Station
- Low volume personal sampler pumps on workers



# Oakridge High School

- Class room monitoring with modified aggressive World Trade Center protocols used to clear apartments
- Classrooms cleaned using WTC protocol



# Oakridge High School

- Air monitoring results
- Limited classroom problems with exception of former storage room
- Mitigation monitoring showed construction techniques and dust suppression effective
- Activity assessment showed low levels of asbestos in soil can yield significant air emissions



# Oakridge High School

- Soil sampling results
- Track decomposed granite sampled with results ranging from 0.001 to 0.02% actinolite by weight
- Imported fill sampled from four possible sources: 3 of the 4 had asbestos detected at  $>0.01\%$  by weight



# Promontory School

- Located in Mafic geologic area
- Outside CGS mapped Ultramafic areas
- No visible outcrops, just soils
- On own initiative school collected samples from various locations
- Analyzed by PLM and TEM
- Asbestos, tremolite, detected at .25 %



# Promontory School

- School District prepared a RAW under DTSC oversight
- Mitigate areas by dust suppression and monitoring during construction
- All exposed areas will be covered with hardscape or clean fill and landscaping
- O&M plan and Institutional Controls



# Union Pacific Rail Yard, Sacramento

- Hub of Southern Pacific Operations since 1863.
- Closed down by end of 1999 except for minor activities.
- 240 acres of prime real estate in the heart of downtown Sacramento
- What will it be?



# Union Pacific Rail Yard, Sacramento

- COCs: Every industrial and commercial chemical possible, including asbestos
- Near soils excavation near foundary, found “chunks of fabric like material” mixed in with soil.
- Analysis showed asbestos.
- Found scattered in other areas of the rail yard



# Union Pacific Rail Yard, Sacramento

- Developed plan to assess asbestos in soil
- Developed plan for dealing with soil containing asbestos needing treatment
- Developed plan to minimize releases to air and conduct air monitoring.
- Site will be deed restricted to preclude sensitive uses without additional controls



# Union Pacific Rail Yard Curtis Park

- 60 acre former railyard
- Asbestos debris from engine boilers, pipe wrapings etc. Removed in early 1990's as IRM. RAP for area based on commercial and industrial usage called for cleanup to 1%.
- Redevelopment plans being developed with mostly unrestricted use over the site.
- Question: Safe residual level to leave in soil?  
Unrestricted, Restricted



# What Is Needed: Soils

- Sampling methodology for assessing sites with potential NOA or asbestos debris
- Sample depth selection protocol
- Guidance for spatial distribution for sampling
- Fill material assessment protocol
- How many samples to get statistical significant characterization



# What Is Needed: Testing

- Uniform test methodology and sample preparation method designed specifically for NOA
- Uniform counting rules
- Low cost test procedure
- Consistent testing methodology
- Reliable and reproducible testing method
- Quick laboratory turn-a-round time
- Sensitivity to match exposure and risk assessment needs



# What Is Needed: Soil Sample Preparation

- How should sample be prepared to reflect asbestos concentrations that pose a current and future risk?
- Respirable now? In the future?
- Transfer to filters or other media for assessment
- Soil to air concentration assessment (eg. Berman/Crump method)



# What Is Needed: Soils Analysis

- Method protocols for environmental sample analysis
- Sensitivity
- Counting Rules
- Reporting:  $<5$ ,  $>5$ ,  $>10$ , other
- How to report “complex” structures or bundles
- Should Transition Fibers be counted
- Should Cleavage fragments be counted



# What Is Needed: QA/QC

- Methods to assess reproducibility of data reports between different analysts within a lab
- Among other labs
- Performance Evaluation samples and protocols for Soils



# What Is Needed: Exposure Assessment

- Activity/ exposure testing
- Activity scenarios including duration and frequency
- Protocol for incorporating the scenarios into a specific site risk assessment
- Assessment of other non-regulated forms of fibrous minerals



# What Is Needed: Risk Management

- Background studies on soils and ambient air concentrations
- Risk Assessment Process Linked to Health Effects from Non-occupational Exposures
- Protocols for Determining Action Levels for Soil Based on Sampling



# QUESTIONS?

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